



The New HP: Two Years Post-Merger

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Presentation agenda

- How we got from there to here
- Where HP is today
- Why Itanium?
- Separating fact from fiction in the CPU space
- Where HP is heading in the future

How We Got From There to Here

- 1957 – Digital Equipment Corporation is Formed
- 1990 – The DECline begins
- 1992 – Ken Olsen retires, Palmer takes the helm
- 1992-1997 – Half a DECade of divestitures
- 1998 – Digital gets Compaq-ted
- 1999 – Pfeiffer Ousted, Capellas Takes Over
- 1999-2001 – Compaq Contraction Continues

How We Got From There to Here...

- June 25, 2001 – Goodbye Alpha, hello Itanium
- September 2001 – HP “proposes” to Compaq
- 2002 – Compaq consummation completed
- 2003 – The new HP reorganizes and rightsizes
- 2004 – HP advances Integrity, AE, and UDC
- 2004 – Opteron and Nocona impact Itanium
- 2004 – TSG consolidates systems and services

The new HP summarized:

Promises made, promises kept

- HP became the “New HP” on 7 May 2002
- After enduring a nine month journey
- Attractions, distractions, and detours on the road
 - Executing the largest IT industry merger in history
 - Rationalizing product lines and eliminating overlap
 - Developing product roadmaps
 - Consolidation, reorganization, and downsizing
 - Dealing with unexpected opposition
- Outcome: mission accomplished,
 - HP has delivered on virtually every promise it made almost two years ago today

A 24-month journey in progress

Challenge: biggest IT merger in history	1 year later: business results	Integration summary: financial results to date
<ul style="list-style-type: none"> • 1,200+ Sites networked • 215K Desktops • 7K+ Applications • 900+ Web servers & infrastructure • 21,671 Servers • 49,000 Network devices • 228K Mailboxes • 26M emails per week • 30M B2B messages monthly 	<ul style="list-style-type: none"> • Customers interact with us as one company • Combined workforce operates as one company • Messaging & collaboration • 200,000+ mailboxes with an address @hp.com 	<ul style="list-style-type: none"> • \$3.5B USD in total cost savings • \$1.3B USD in supply chain integration savings • 26% reduction in BTO PC manufacturing costs • \$20M USD annual savings in financial transaction costs • 24% reduction in IT costs • Apps portfolio reduced from 7K to 5K • E-business operations on a path to triple transactions by 2004

HP's hardware strategy

- Hardware evolution drives the rise of EPIC
- HP standardizes on Itanium for enterprise systems
- AMD Opteron and Intel Nocona enter the picture, delivering 64-bit support to ProLiant systems.
- Customer choice drives platform selection
- Intel Itanium hardware will form the basis of all HP enterprise systems
- This includes the next-generation Post-Superdome server due in 2007-2008

A chat about CPUs

- A hot topic with more misconceptions than facts
 - Alpha's omega and Itanium's ascent: Darwin was right
 - Beyond Darwin, there's always business
- New enhancements to an aging architecture
 - x86 Architecture Fortified With 64-bit Extensions
 - The Impact on Itanium: Unintended Consequences

Alpha retired, Itanium hired

- How and why did this happen?
- Darwin was right
- “The Origin of Species” sums it up in two lines
 - Evolution happens
 - Only the strong survive
- Microprocessor evolution from 1960
 - Early specialized CPUs supplanted by CISC
 - RISC replaced CISC
 - EPIC will replace RISC

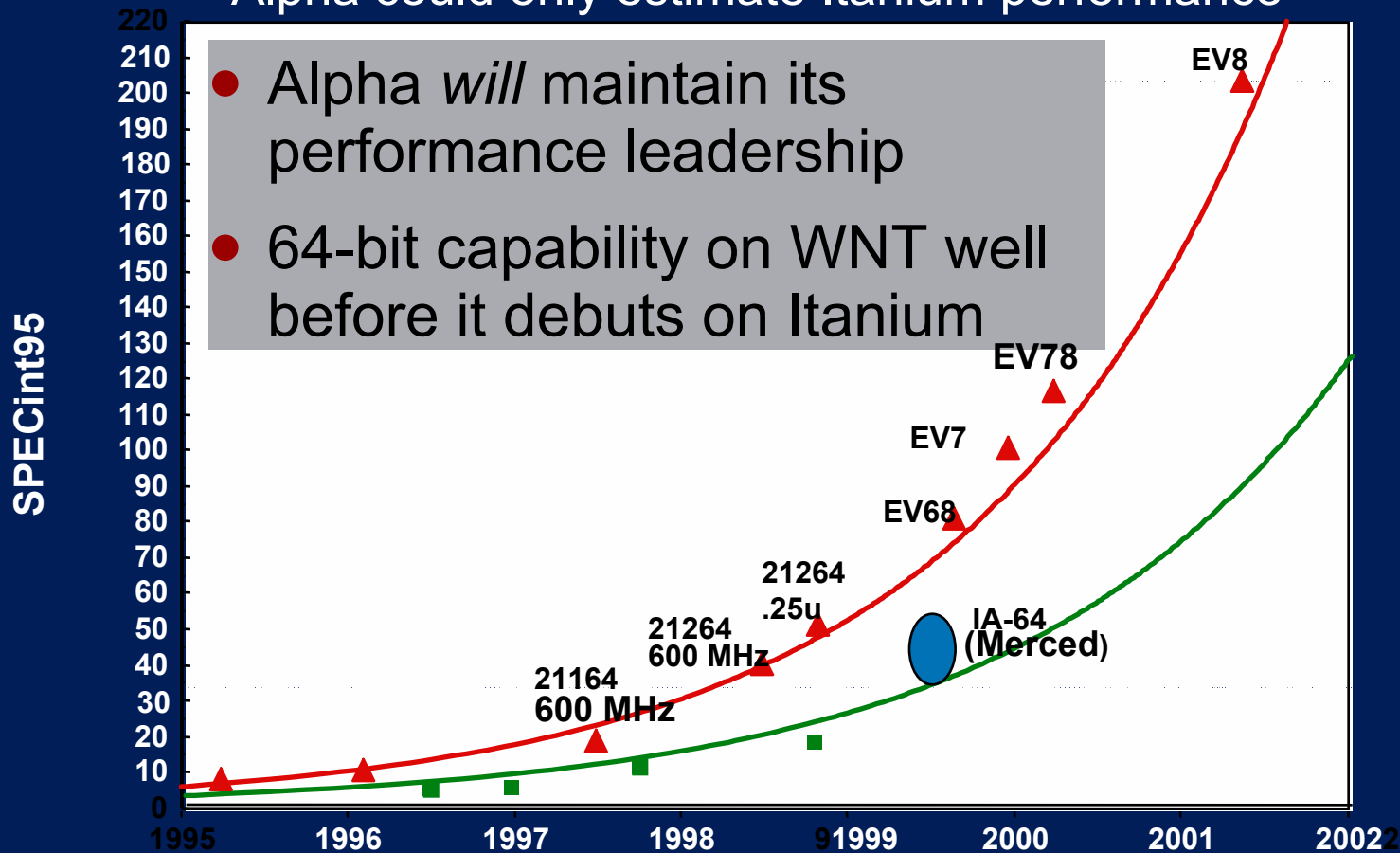
Alpha's omega

Business, technology, and corporate policy

- Technology: Alpha as roadmap roadkill
- Alpha's "twice the performance of Intel" differentiator
 - Itanium appeared on Alpha charts before Intel delivered a CPU
 - Compaq projected Alpha performance, guessed about Intel
 - The following curve reflected Compaq's expectations for Intel
- Alpha would maintain performance leadership over Intel
 - Without a value proposition, Alpha was toast
- Compaq used the same 1998 slide through mid-2001

Alpha/Itanium Roadmap Circa 1998

Alpha could only estimate Itanium performance



The business of CPU death and life

- Alpha's fate was sealed by the Intel roadmaps
 - Alpha already was bound for oblivion because:
 - Sales volumes decreased, costs increased, EV8 unaffordable
 - Intel invited Compaq to review the Itanium roadmap in 2000
 - Itanium performance parity by EV7, superiority thereafter
 - Negotiations, Alphacide, and Itanium rising
 - Itanium already heir apparent, Intel wanted Alpha finished fast.
 - The results: Compaq granted Intel rights to use and modify the Alpha architecture, and provided all Alpha IP. Alpha processor and compiler developers were offered jobs at Intel. Compaq agreed to adopt Itanium as the strategic successor to Alpha when all EV7 work was complete. Agreement was top secret.

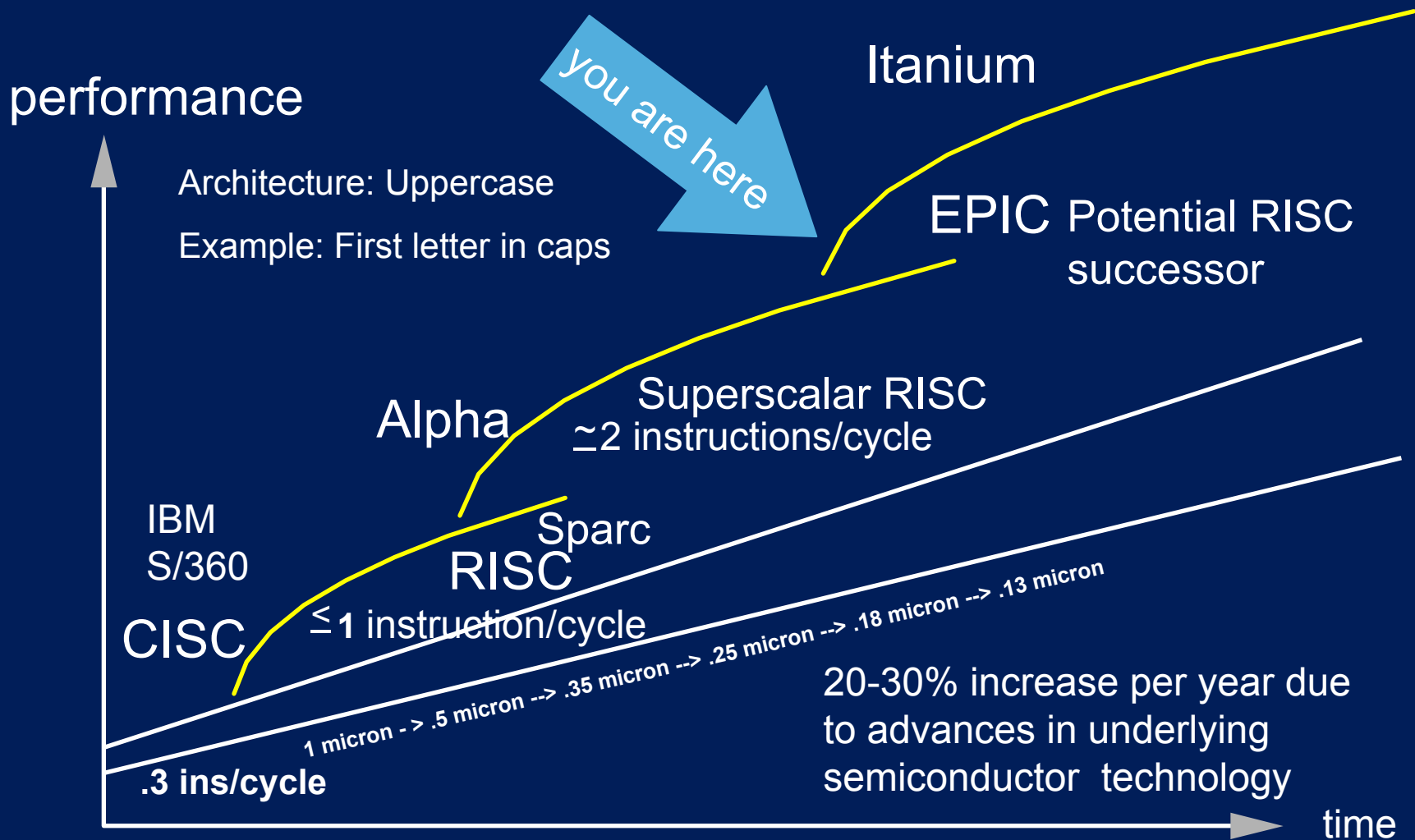
Alpha's out and Itanium's ascendant

- The timing of a processor execution isn't easy!
 - Compaq wanted to use the EV7 launch to announce Itanium as an “option,” Intel wanted a rapid closure.
- In April 2001, Compaq realized 2FQ would be ugly.
- Finalizing the Alpha technology transfer to Intel by the end of the quarter would resolve the financial issues. Marketing effort began in early June for a 25 June announcement.
- Intel prospered, and Compaq endured great wrath. But with Alpha no longer the “other woman” in the Intel-Compaq relationship, that relationship improved.
- And Intel got a big-name addition to the Itanium adoption list.

Acts of omission in prognostication?

- Back to the original chart:
- “It’s difficult to predict, especially the future”
- Projecting the future performance of one’s own product is feasible.
- Probability decreases as distance increases.
- Projecting the future performance of a rival product is more guesswork than extrapolation.
- And processor evolution plays a role
 - If EPIC is the successor to superscalar RISC
 - Itanium projections were much lower than reality

Evolution changed the curve...



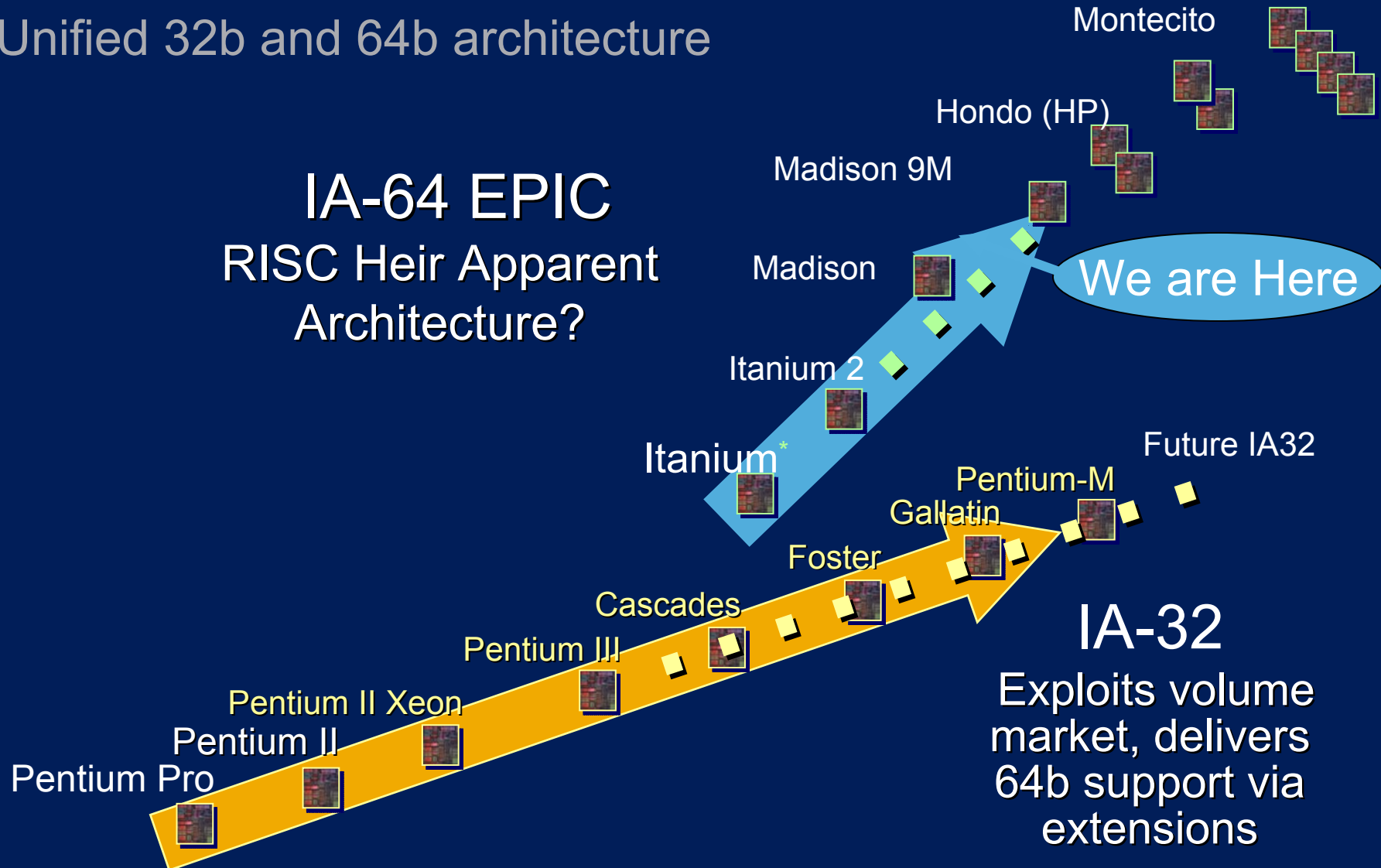
Intel architecture roadmap

Unified 32b and 64b architecture



Tukwila

IA-64 EPIC
RISC Heir Apparent
Architecture?



Why Itanium as Alpha's successor?

- Several reasons:
 - Preordained not by by stars or fate, but by roadmap
 - Successorship ensured via contractual agreement
- Itanium has “all the right stuff”
 - Enterprise-class OLTP performance and scalability
 - High floating point performance for HPTC applications
 - Supports all HP mission critical enterprise OSes including NSK, OpenVMS, and HP-UX
 - Supports volume OSes (Windows, Linux), thus spanning a full heterogeneous environment

The rest of the right stuff

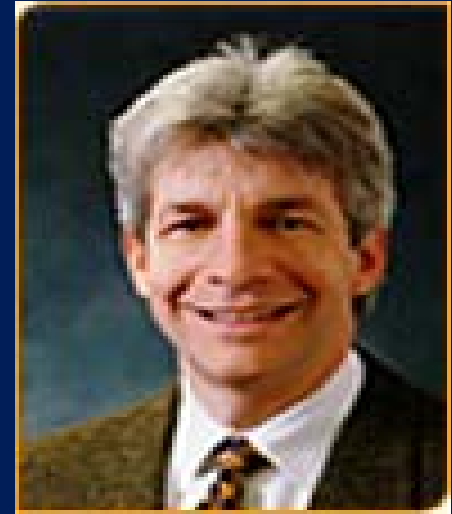
- Other Itanium differentiators
 - Scalability, headroom and RAS features eclipsing those offered by any x86 CPU, with or without extensions.
 - An aggressive annual upgrade schedule
 - Management starts at the core in multiple-core CPUs
 - Immense cache sizes and physical memory support
 - Itanium will survive the coming CPU shakeout.
- Itanium will achieve industry standard status
 - Later than planned; x86 extensions own volume space.

Things were looking good for IPF

- Itanium arrives – late and lacking performance
- McKinley successor arrives a year later
 - HP takes charge of compiler development
 - Higher performance, broader acceptance
 - Products begin to proliferate, HP Integrity thrust begins
- Madison debut imminent
 - Performance projections portended leadership
- Then along comes 18 February 2004...

Itanium interruptus?

- Breaking News from IDF
 - HP will offer AMD Opteron and Intel Nocona x86 CPUs with 64-bit extensions on ProLiant servers.
 - HP's commitment to Xeon & Itanium as strategic industry standard platforms for the future remains unchanged
 - Itanium-based Integrity servers deliver enterprise scalability and performance
 - Itanium NonStop systems get huge future performance gains
- Itanium remains intact and on track



Fister and Robison



What is 64-bit Extension Technology?

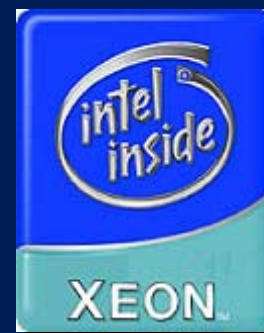


+

Extended Memory
Addressability
64-Bit Pointers,
Registers

Additional Registers
8-SSE & 8-Gen Purpose

=



Double Precision (64-bit)
Integer Support

With 64-Bit
extension
technology

Evolutionary IA-32 architectural enhancements to
support extended memory starting in mid-2004

And what do extensions give me?

- More choice in the ProLiant space
 - Compaq developed, but didn't ship, an Alpha ProLiant
 - Opteron option available now, Nocona next
 - Consistent design across all ProLiant product lines
- Systems offered in three form factors
 - 100 series – economy-class HPC
 - 500 series - 4P performance for power-starved apps
 - BL series - Blades run cool, use less fuel are great for HPC
- Benefits both 32-bit and 64-bit users
 - Linux and Windows supported in 64-bit mode today
 - 32-bit users can address as much as 64b of memory while gaining a performance boost

X86 extensions benefit many...

- 64-bit computing: inevitable, and now it's sooner
- x86 with 64-bit extension technology will speed the development of a full 64-bit ecosystem
 - Day one 64-bit Windows and Linux support
 - Accelerating 32-bit to 64-bit apps upgrade rates
 - 32-bit apps freed 4GB addressing limit of 32-bit CPUs
 - And an unintended consequence for Itanium
 - Intel must increase the frequency and magnitude of Itanium price cuts to compete in volume market
 - Intel's loss is Itanium OEM and customer gain

Why should I bother with Itanium?

- X86 extensions are not all things to all people
- There's plenty of areas in which Itanium adds value. One area reflects the EPIC architecture.
- EPIC eliminates RISC limits
 - Lower latency and higher throughput
 - High performance through parallelization
 - Up to 2x performance per clock cycle
 - Massive on-chip resources to boost apps performance
 - Lower memory latency gap with shorter pipelines

What else can Itanium do?

- Itanium can go places where x86 isn't an option.
- Enterprise support
- If you're an enterprise user who wants a system larger than 8P and you require support for VMS, NSK or HP-UX, Itanium provides all of the above, as well as 64-bit Linux and Windows.
 - Indeed, you can run four of these OSes concurrently in separate hard partitions on a Superdome... today.
 - Due to architectural necessity, NSK requires its own box, but it remains key component of HP's AE strategy.
- As a new architecture, EPIC is built to last...

Itanium sustainable advantages



Unique Technology Features			
Optimized for Parallelism	Massive On-Chip Resources	Efficient Utilization of Memory Hierarchy	Leading RAS Built-In
Application Targets			
Floating Point Intensive apps: HPTC, SAS, MCAE	Fastest Data Transforms: MCAE, image manipulation, voice encoding/recognition, encryption	Commercial apps: OLTP, DB query (TPC-H), sorting Technical apps: MCAE, voice recognition	Scalable Mission-Critical Apps: OLTP, ERP, data warehouse, data mining

Choose Your Weapon... or CPU

- IF... a 1P to 8P ProLiant running 64-bit Windows or Linux meets your needs...
- THEN... Opteron and Nocona are a good choice
- IF... you need a 1 to 128P enterprise system that can run HP-UX, NSK, or VMS as well as the commodity OSes listed above while delivering superior RAS and manageability capabilities...
- THEN: HP Integrity and Itanium are for you!

A press blunder of EPIC size

- “X86 with extensions is equivalent to EPIC”
 - False conclusion, successful quantum leap.
 - A few facts the press failed to consider
 - Extending a 25-year-old 32-bit architecture to support extended memory addressing and 64-bit versions of two volume OSES does not render Opteron or Nocona the equal of Itanium.
 - Opteron and Nocona lack the scalability and RAS capabilities required by enterprise systems
 - Opteron and Nocona do not support enterprise OSES. There are no plans to port VMS or NSK or HP-UX to these platforms, and feasibility of doing so is unknown

Is Itanium dead? I read this article...

- Was the article backed up by facts? Probably not!
 - No. Itanium's alive, the press has a problem separating news and opinion. Printing a news article proclaiming the death of Itanium is bad journalism.
- News is factual information backed by evidence
- The introduction of X86 extensions was news
- The impact of this news on Itanium is opinion. The issue merited coverage on the editorial page. Treating opinion as news confused customers and hurt vendors.

How do extensions affect HP?

- Does this change HP's industry standard server or Itanium processor strategy?
 - No. The ProLiant strategy is validated, and Itanium remains the 64-bit enterprise CPU of choice.
- Is Integrity and ProLiant positioning a problem?
 - No. Differentiating low-end Integrity and ProLiant products is now an issue. Overlapping capabilities in the 1P to 8P space means customers will choose the product that best fits their needs.

What's the impact on Itanium?

- Will this affect the acceptance of Itanium CPUs?
 - Slightly, but not to the extent that adoption rates will be affected in high volume low cost market.
- What about the Itanium adoption rates?
 - The rate will not meet Intel's expectations in the near term, as Opteron and Nocona will address the high volume market. Intel must accelerate the speed and magnitude of its Itanium price cuts to play in this market.

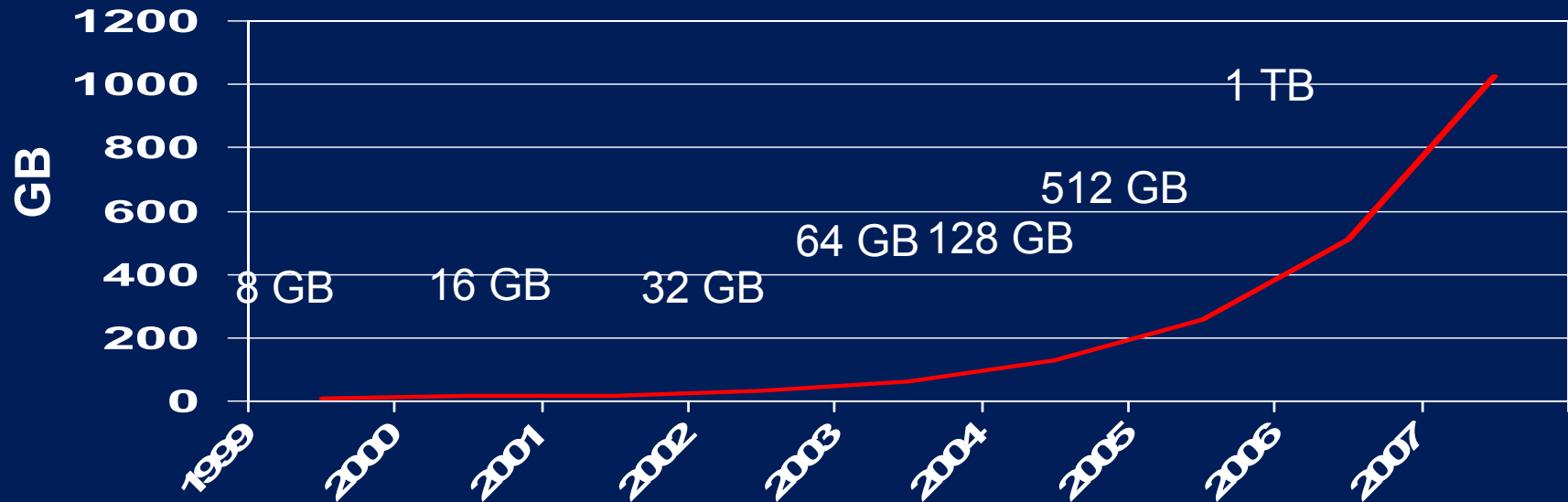
HP, Integrity, and the future

- 64-bit computing imposes new demands
 - Performance
 - Memory
 - Scalability
 - Reliability
- HP Integrity systems meet these demands
 - Today
 - And in next-generation systems, too

64-bit computing becomes pervasive



- 4p server memory will exceed 1 TB by 2007



- Why? Apps are a driving force to 64-bit computing
 - Security - biometrics, encryption, virus scanning
 - Huge data warehousing, rich data types over the Internet
 - Complex technical workloads (graphics, imaging, MCAE)

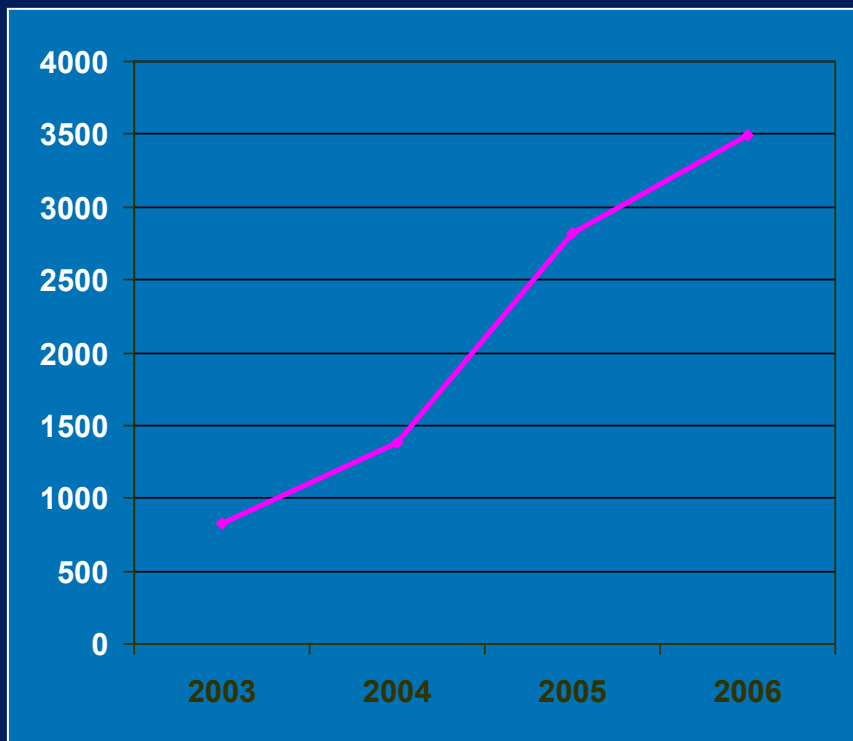
HP gains Integrity with Itanium

- At HP, Itanium and industry standards rule!
 - HP: first to offer a complete Itanium-based product set ranging from 1P to 128P
- 3 November 2003: HP fleshes out Integrity line
 - New four-way eight-way, and 16-way servers
 - 8-and 16-way models are Superdome subsets
 - They reflect the Superdome cellular architecture
 - Also announced was the HP XC6000 cluster for HPTC
 - Up to 512 HP Integrity rx2600 systems, choice of
 - High-speed interconnects from Quadrics LTD and Myricom

HP system performance projections

Estimated System OLTP

Integrity enhancements



Superdome performance modeled in example

- Follow Intel roadmaps
- Dual CPU motherboard doubles CPU count in 2004
- Mixed Madison support
- In-cab upgrades to sustain scalability, support PA-RISC to Itanium upgrades

Now it's time for something new...

- Alpha, PA-RISC, and MIPS will be technically obsolete by 2006—2007
- HP's NonStop successor system ships in '05
- By ~2007, a Superdome successor will be crucial to HP's ability to compete in the enterprise
- IPF removes CPU performance as gating factor, so HP will differentiate above the CPU level

HP Superdome successor ~2007

- Goal: create the mother of all enterprise servers
- Distributed design and development process
 - Produced by ~50-person IPF development section as part of the High Performance Systems Lab in Hardware Systems Technology Division. Section has two teams:
 - An advanced development team to define a new system architecture, and a roadmap to get from base technology assessment to proof of concept.
 - An implementation team to deliver a next-generation system consistent with current development practices. Existing HP chips, CPUs, I/O components, and diagnostics will be used wherever possible to reduce cost and speed time to market

What are these teams building?

- Attributes and goals of a Superdome successor
 - Strategy: innovate and expand existing technology
- Likely physical characteristics:
 - Appearance: Superdome-like but larger
 - Design: Superdome-centric with Alpha attributes
- Results and Goals:
 - Superdome successor with substantially higher performance and scalability than the incumbent
 - Deliver the first, true, open-systems alternative to proprietary mainframe and parallel cluster technology. And, a new ability to attack IBM.

“Beyond Superdome:” visualize this!

- To maintain parity and strive for superiority in HPTC and enterprise computing, HP needs a next-generation server that offers the highest possible performance at the lowest possible cost. What the product will look like is unknown.
 - If you want to know what lies Beyond Superdome, you can visualize a future system if you know enough of its attributes. Superdome-centricity and use of existing technology are givens.
 - So I’ll close with information that’s less commonly known. Three more slides and you can create a vision of the future will be uniquely your own. Have fun!

HP future server attributes

- Fulfilling the need for speed...
 - Support for 256 or more >6GHz CPUs and multiple partitioning techniques deliver SC-like systems in a box
 - Cache and physical memory sizes sufficiently large to enable virtually any application to run in memory
 - Performance objectives
 - TPC-C numbers of several million (at least 5M is my guess)
 - HPTC performance sufficient to model almost any issue

HP future server attributes

- Availability to anyone anywhere for anything
 - An order of magnitude improvement in availability provided by proactive diagnosis tools that anticipate failures and automatically correct them via re-configuration or replacement of failing components.
 - An easily clustered, interoperable system based on low-cost industry standard components and able to run all HP OSes and a complete applications portfolio. The system should be Grid-enabled and able to run on its own or as a component of the HP Utility Datacenter

Managing the server of the future

- How do you manage what does not yet exist?
 - Most of the tools and building blocks already exist
 - HP can run a UDC today
 - The Adaptive Enterprise suite is being fleshed out
 - OpenView is being extended
 - HP's partition magicians have a big bag of tricks today
- Probable management environment
 - Take the OpenView foundation available now
 - Add partitioning, COD, and AE tools available in 2007
 - The results: the next-generation system “control panel”
- Thanks again, and have fun visualizing the future!

And in conclusion

- I thank you for your time and attention
- And I thank HP and Interex for letting me speak
- HP has delivered on its promises
- No reason to doubt that promises will continue to be kept
- Itanium and standards remain core elements to HP strategy
- The Superdome successor will be the hardware basis of HP's Utility Data Center
- SKHPC's forecast: continued success for HP

